

## 6.4 MECHANICAL, ELECTRICAL, AND PLUMBING COMPONENTS

### 6.4.7 ELECTRICAL AND COMMUNICATIONS EQUIPMENT

#### 6.4.7.2 EMERGENCY GENERATORS

Emergency generators are essential for postearthquake operations for many types of facilities. These range from small residential size generators to large systems required to maintain hospital or other essential operations. Emergency generators are often mounted on vibration isolators.

#### TYPICAL CAUSES OF DAMAGE

- Emergency generators may slide, tilt, or overturn. Internal elements may be damaged by inertial forces.
- Unanchored or poorly reinforced housekeeping pads may fail, resulting in excessive movement of the supported equipment.
- Vibration isolators can fail causing excessive generator movement.
- Failure of the emergency power generating system may be caused by the failure of any of the component parts including generator, fuel tank, fuel line, batteries and battery racks.

#### SEISMIC MITIGATION CONSIDERATIONS

- Working around electrical equipment can be extremely hazardous. Read the Electrical Danger Warning and Guidelines in Section 6.6.8 of this document before proceeding with any work.
- Many equipment items can be supplied with a structural steel base, shop welded brackets, or predrilled holes for base anchorage. For any new equipment, request items that can be supplied with seismic anchorage details.
- For equipment mounted on a free-standing concrete pad, make sure pad is large enough to resist seismic overturning of generator.
- Check the anchorage for all the component parts of the emergency power generation system; failure of any one of them could compromise the postearthquake performance of the system. Provide flexible connections for the fuel line, exhaust ducting and any other connected utility.

- See Section 6.4.1.1 for additional base anchorage details. Refer to FEMA 413 *Installing Seismic Restraints for Electrical Equipment* (2004) for general information on seismic anchorage of electrical equipment.

### Mitigation Examples



Figure 6.4.7.2-1 Emergency generator is anchored to a concrete inertia base. The inertia base is mounted on spring isolators and restrained by steel angle snubbers on all sides (Photo courtesy of Maryann Phipps, Estructure).



Figure 6.4.7.2-2 Emergency generator with skid mount on housekeeping pad; shear lugs added following the 2001 Peru Earthquake (Photo courtesy of Eduardo Fierro, BFP Engineers).

## Mitigation Details

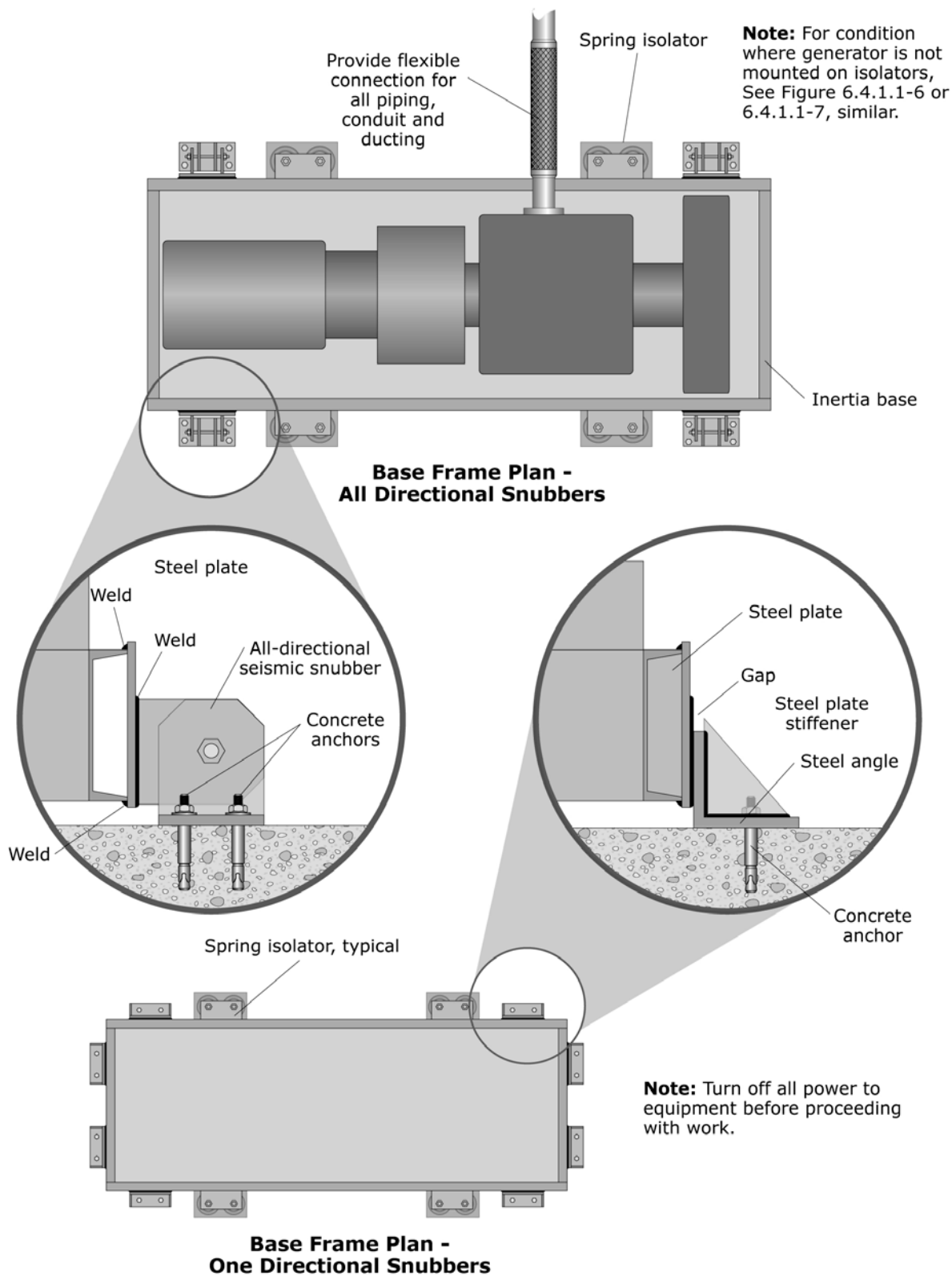


Figure 6.4.7.2-3 Emergency generator (ER).